

ABSTRACT OF THE DISCLOSURE

A displacement measuring device including a scale, and an optical readhead including an index pattern and a light receiving element is provided. A bright/dark pattern arising from a scale grating is detected by the readhead to measure displacement. In various
5 embodiments, a magnification of the pattern is adjusted by the spacing between at least a lens element, aperture element, and detection plane of the readhead. An aperture can be designed to provide a diffraction-limited telecentric imaging configuration that filters an image of the scale grating to provide a sinusoidal intensity pattern that supports highly interpolated measurements. An aperture dimension, selected in relation to the grating pitch and other
10 parameters, can provide a desirable combination of readhead operating characteristics including one or more of a desired depth of field; degree of spatial filtering; and optical signal power.